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EXAMINER

STAPLES, MARK

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/575,804	Applicant(s) HAN, JAIN	
	Examiner MARK STAPLES	Art Unit 1637	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 November 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37, 69, 79 and 89 is/are pending in the application.
- 4a) Of the above claim(s) 11, 13, 26, 36, 69, and 79 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 12, 14-25, 27-35, 37 and 89 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Applicant's amendment of claims 1, 22, and 25 and the submission of new claim 89 in the paper filed on 11/04/2009 is acknowledged.

Claims 1-10, 12, 14-25, 27-35, 37, and 89 are pending and at issue.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Objections and Rejections that are Withdrawn

2. The objection to the title is withdrawn in light of Applicant's agreement to amendment of the title. The title is amended to:

"Primers with 5' end binding tags for methods of multiplex amplification of nucleic acids"

3. The objection to claim 1 is withdrawn in light of Applicant's amendment of the claim.

4. The objection to tables in the disclosure is withdrawn in light of Applicant's amendment of the tables.

5. The objection to improper use of the trademark LUMINEX® is withdrawn as Applicant has amended the specification to properly indicate this trademark.

Sequence Rules Compliance

6. It is acknowledged that Applicant has amended pages 35-39 of the specification to be in compliance with sequence rules.

Claim Rejections Withdrawn - 35 USC § 112 Second Paragraph

7. The rejections of claims 22 and 24 under 35 USC § 112 Second Paragraph are withdrawn in light of Applicant's removal of the word "plurality" from these claims and amendment to recite the number of primers supported by the specification.

Rejections that are Maintained

Claim Rejections Maintained - 35 USC § 102 (e)

8. The rejection of claims 1-10, 12, 14-22, 27, 29-34, and 37 under 35 U.S.C. 102(e) as being anticipated by Chen (Chen '970, United States Patent 7,262,030 issued 2007 with priority to Application NO. 10/476,970 with priority to PCT PCT/US02/14431 in English and filed 08/30/2002) is maintained. The rejections are re-presented below. Applicant's arguments have been fully considered but they are not persuasive.

Applicant argues that that Chen '970 does not amplify a target site within a target sequence with both inner and out primers and thus does not amplify the target sequence, as claimed. However and while Chen '970 teaches this embodiment, Chen '970 teaches that the target site which can be the target sequence may be amplified by both inner and outer primer:

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“Similarly, in other embodiments of the present invention, it may be desirable to PCR amplify more than one target site at a time. In some cases, this may be carried out by a multiplex PCR reaction in which inner and outer primers for all target sites of interest are amplified simultaneously in a single reaction. Alternatively, **one or more sites may be amplified** together, or each site may be amplified alone, either **in a single reaction with both inner and outer primers**, or in two reactions, one for the inner and one for the outer primers as described above. Any combination of PCR amplification reactions may be utilized in the practice of the present invention, so long as the procedure results in the production of suitable sequencible and/or ligatable structures” (emphasis by Examiner, see column 11 lines 39-52).

Chen ‘970 further illustrates in Figures 2A and 2B that inner and outer primers amplify the target sequence and as described at column 5 lines 32-44).

It is further noted that in a preferred embodiment, Chen ‘970 does not amplify a target site which is a single nucleotide polymorphism, an SNP (and noting that by definition a single nucleotide is not a sequence and thus cannot be a “target sequence”). However, there is no recitation in the instant claims as to whether a target site, especially the embodiment of an SNP which is not a sequence, is amplified or not amplified. Chen ‘970 is amplifying at least one “target sequence” by both outer and inner primers and this “target sequence” the portion amplified by the inner primers where the portion is of the DNA molecule first amplified by the outer primers. It is noted that Chen ‘970 later uses this portion, the “target sequence” for identifying the SNP, but as the instant claims recite methods “comprising” steps, this additional step of Chen ‘970 is encompassed by the instant claims.

Thus while Chen ‘970 teaches embodiments other than the claimed invention, Chen ‘970 teaches embodiments of the claims and thus anticipates the claimed invention.

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9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. Claims 1-10, 12, 14-22, 27, 29-34, and 37 are rejected under 35 U.S.C. 102(e) as being anticipated by Chen (Chen '970, United States Patent 7,262,030 issued 2007 with priority to Application NO. 10/476,970 with priority to PCT PCT/US02/14431 in English and filed 08/30/2002).

Regarding claims 1-3, 20, 27, and 37, Chen teaches methods for multiplex primer-based amplification with inner and outer primers of a selective target sequence from a plurality of agents of genotypes (entire patent especially the Abstract), said target sequence being different for each agent, said method comprising:

a. carrying out a first amplification reaction for each target sequence to be amplified which is a first round of PCR (see claims 1 and 11) using

i) as a template, a nucleic acid from each of said plurality of agents, said nucleic acid containing said target sequence (see claims 1 and 11, and column 7 lines 8-67);

ii) a first pair of target enrichment primers hybridizing to said nucleic acid and bracketing said target sequence which are outer primers (see claim 1, Figures 1 and 2, especially Figures 2A and 2B and which can be P1 primer and one of either P3 or P4 primers, and column 7 lines 8-67);

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- iii) a second pair of target enrichment primers hybridizing to said nucleic acid and bracketing said target sequence, said second pair of target enrichment primers being located proximate to said target sequence and one of the second pair of target enrichment primers comprising at its 5' end a binding tag corresponding to the sequence of one of a pair of target amplification primers and the other of the second pair of target enrichment primers comprising at its 5' end a binding tag corresponding to the sequence of the other of said pair of target amplification primers (see claims 1 and 11, and Figures 1 and 2 and which can be P1 and P3 primers); and
- iv) amplification reagents and conditions for said first amplification reaction such that the first amplification reaction generates a plurality of first amplification products, wherein at least a portion of the first amplification products contain said target sequence and at least one complement of the binding tag for one of said target enrichment primers thereby forming at least one binding site for at least one of said target amplification primers (which includes PCR amplification, see claims 1 and 11, and Figures 1 and 2); and
- b. carrying out a second amplification reaction for each target sequence to be amplified which is a second round of PCR (see claims 11, 13, and 15 and see column 11 lines 39-52) using
 - i) as a template, said portion of the first amplification products containing said at least one binding site for at least one of said target amplification primers (see claims 11, 13, and 15);

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- ii) at least one of said first pair of target amplification primers binding to its corresponding binding sites on said portion of said first amplification products (see claims 11, 13, and 15); and
- iii) amplification reagents and conditions for said second amplification reaction which is PCR such that the second amplification reaction generates a plurality of second amplification products containing the target sequence (see claims 11, 13, and 15).

Regarding claims 4-7 and 21, Chen teaches primers varying in length and primers which are 23 nucleotides in length (see sequences 5-9 in column 23 line 79 to column 26 line 40)

Regarding claims 8 and 9, Chen teaches where the target enrichment primers are at a low concentration relative to the high concentration of the target amplification primers (see claim 15). Further regarding claim 9, Chen teaches the low concentration of 10 nM which is 0.01 uM and greater than 0.002 uM and teaches the high concentration of 100 nM which is 0.1 uM and approximately 0.2 uM.

Regarding claim 10, Chen teaches the target primary primers are limited for example to about 1-5% for a regular PCR see which thus is not sufficient for exponential amplification; and that the secondary primers amplify unlimited which is sufficient for exponential amplification (see column 9 lines 4-22).

Regarding claim 12, Chen teaches the inner primers which are target enrichment primers can vary in concentration with one inner primer being 600 nM and the others 400 nM (see column 7 lines 43-45).

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Regarding claim 14, Chen teaches that the target amplification primers can vary in concentration, that is that one primer may have a higher concentration, in accordance with the length of the primers (see column 14 lines 9-28).

Regarding claims 15 and claims 29-34, Chen directly detecting fluorescently labeled oligonucleotides ligated to a target (see column 11 lines 61-64) and where the ligation of the target is directly combined with the second amplification PCR reaction, resulting in a closed tube assay (see column 13 lines 42-45).

Regarding claims 16-19, Chen teaches various cycles, times, and temperatures for amplification processes (entire patent) and teaches that these can be varied and that their methods with primers to two domains facilitates primer annealing to avoid problems with thermocycling (see column 8 lines 1-23) and with one example being:

“The cycling condition was 95°C. for 10 min, followed by 10 cycles of 95°C. for 45 sec., 65°C. for 5 sec., ramping to 55°C at 0.1° C./sec and 55°C. for 90 sec. . . . The cycling conditions for the second reaction was following: 95°C. for 10 min, followed by 30 cycles of 95°C. for 45 sec., 55°C. for 90 sec.” (see column 6 lines 35-47).

Further regarding claims 16-19, Chen teaches as noted above. Chen teaches methods of amplifying nucleic acids with various conditions of cycles, times, and temperatures.

Chen does not specifically teach the exact conditions of instant claim 16-19.

It would also have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to use the amplification conditions as used by Chen since these differences in the amplification conditions would not be expected to greatly alter the amount of amplification products generated. Though the effective concentration of a product at any given condition might be lower, this would be offset by

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the longer cycle times and or more cycles. “For example, one could use 70°C. as the annealing temperature for the primary reaction and cycle 10 times, then the temperature could be lowered to 50°C. for 30 more cycles” (see last sentence of paragraph 0059).

This is consistent with the Federal Circuit decision in In re Peterson, 65 USPQ2d 1379, 1382 (Fed. Cir. 2003) “We have also held that a prima facie case of obviousness exists when the claimed range and the prior art range do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties.”

Thus, an ordinary practitioner would have recognized that the conditions for amplification could be adjusted to maximize the desired results. As noted in *In re Aller*, 105 USPQ 233 at 235,

More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.

Routine optimization is not considered inventive and no evidence has been presented that the selection of amplification conditions was other than routine, that the products resulting from the optimization have any unexpected properties, or that the results should be considered unexpected in any way as compared to the closest prior art. As noted, a skilled artisan would expect the claimed conditions for amplification to have nearly identical results for the amount of amplification products. Thus, an ordinary practitioner would have recognized that the results could be adjusted to maximize the desired results.

Regarding claims 22 and 23, Chen teaches at least three amplification primer pairs of: (1) inner primer pair P1 and P2, (2) outer primer pair P1 and P3, and (3) inner

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primer pair P4 and P2 (see Figure 1, see column 7 lines 8-32 for the first two primer pairs, and see column 7 lines 33-66 for the third primer pair and noting that even further primer pairs are described and P4 might be designed to be in another primer pair). The “enhancement primers” of claim 22 are interpreted to be primers used in the method of instant claim 1.

Claim Rejections Maintained - 35 USC § 103

11. The rejection of claims 1-10, 12, 14-23, and 27-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen (Chen '381, United States Patent Application 20030096277, Application No. 10/231381, published 05/22/2003, filed 08/30/2002), Jeffreys (United States Patent 5,811,235 Issued 1998), and as further evidenced by Erlich et al. (United States Patent 5,314,809 issued 1994) and by QIAGEN (2002) is maintained. The rejections are given below. Applicant's arguments have been fully considered but they are not persuasive.

Applicant applies the arguments of Chen '970 to this rejection over Chen '381. However Chen '381 does teach the enrichment primers of the instant claims as given below (and noting that Chen '381 does not exclude the “target site” in amplification by the primers as argued for Chen '970).

Applicant further argues that Applicant achieved results which were unexpected as the target acids are efficiently amplified. However, Chen '380 specifically teaches that that claimed primers in the claimed configuration increase specificity and detection (entire publication, especially the Abstract). Chen '380 further teaches:

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“The separation of the functions of allele discrimination and product amplification makes it possible to achieve high specificity and amplification efficiency . . . “

(paragraph 0019).

Thus the results which Applicant points to were to be expected in view of the teachings of Chen '380.

Applicant argues that Jeffreys does not specifically teach bracketing a sequence with a binding tag or tail as described in claim 1. However, Chen '380 is primarily relied upon for this teaching. However Jeffreys does teach bracketing as claimed as positions of the initially amplified sequence are amplified in a further amplification. Thus Jeffreys teaches similar to Chen '380 and at least teaches the same general bracketing of Chen '380. Thus it would have been obvious to one of ordinary skill in the art at the time of the claimed invention to combine the tail primers of Chen '380 for bracketing target sequences with the first amplification tail primer methods of Jeffreys to improve the sensitivity and specificity of the second amplification, as taught by Chen '380.

Claims 24, 25, and 35

Applicant argues that as the rejections of claim 1 would be withdrawn that the rejections of dependent claims 24, 25, and 35 should also be withdrawn. However, as the rejections of claim 1 are maintained as given above, the rejections of claims 24, 25, and 35 are also maintained.

Claim Rejections Maintained - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 1-10, 12, 14-23, and 27-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen (Chen '381, United States Patent Application 20030096277, Application No. 10/231381, published 05/22/2003, filed 08/30/2002), Jeffreys (United States Patent 5,811,235 Issued 1998), and as further evidenced by Erlich et al. (United States Patent 5,314,809 issued 1994) and by QIAGEN (2002).

Regarding claims 1 and 28, Chen teaches methods for multiplex primer-based amplification of a target sequence from a plurality of agents of genotypes (entire publication especially the Abstract), said target sequence being different for each agent, said method comprising:

- a. carrying out a first amplification reaction for each target sequence to be amplified which is a first round of PCR (see claim 10) using
 - i) as a template, a nucleic acid from each of said plurality of agents, said nucleic acid containing said target sequence;
 - ii) a first pair of target enrichment primers hybridizing to said nucleic acid and bracketing said target sequence (see claim 10, Figures 1 and Figure 2A especially elements 10A, 10B, and 30, and paragraph 0072 noting first primers SC 22, SC 23, SC 24 for marker

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SC 22 and second primers SC 22, SC, 31, SC 32, SC 33 for marker SC 31; and see paragraph 0019);

iii) a second pair of target enrichment primers hybridizing to said nucleic acid and bracketing said target sequence, said second pair of target enrichment primers being located proximate to said target sequence and one of the second pair of target enrichment primers comprising at its 5' end a binding tag corresponding to the sequence of one of a pair of target amplification primers and the other of the second pair of target enrichment primers comprising at its 5' end a binding tag corresponding to the sequence of the other of said pair of target amplification primers; and

iv) amplification reagents and conditions for said first amplification reaction such that the first amplification reaction generates a plurality of first amplification products, wherein at least a portion of the first amplification products contain said target sequence and at least one complement of the binding tag for one of said target enrichment primers thereby forming at least one binding site for at least one of said target amplification primers (see claim 10, Figures 1 and Figure 2A especially elements 10A, 10B, and 30, and paragraph 0072 noting first primers SC 22, SC 23, SC 24 for marker SC 22 and second primers SC 22, SC, 31, SC 32, SC 33 for marker SC 31; and see paragraph 0019); and

b. carrying out a second amplification reaction for each target sequence to be amplified which is a second round of PCR (see claim 10) using

i) as a template, said portion of the first amplification products containing said at least one binding site for at least one of said target amplification primers (see claim 10;

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ii) at least one of said first pair of target amplification primers binding to its corresponding binding sites on said portion of said first amplification products by teaching; “at least one secondary primer having a second homologous portion which comprises sequences identical to those of said non-homologous portion of said primary primer” (see claim 10, Figures 1 and Figure 2A especially elements 20A, 20B and 40, paragraphs 0072 and 0019, and noting that this second primer of Chen is the target amplification primer of the instant claim); and

iii) amplification reagents and conditions for said second amplification reaction which is PCR such that the second amplification reaction generates a plurality of second amplification products containing the target sequence (see claim 10).

Further regarding claim 28, it is noted that Chen teaches the target amplification primers necessarily have a means for detection which is their sequences are used as the means to detect the target.

Regarding claim 1, Chen suggests but does not specifically teach that the first amplification reaction comprises two primer pairs to the same target sequence.

Regarding claims 4-7 and 21, Chen teaches different length of the first pair target enrichment primers varying in length for 10-40 and 10-30 nucleotides (see Table 1). Further regarding claims 4-7 and 21, Qiagen teaches stanrad primers range from 18-30 nucleotides which overlaps with the claimed ranges (see Table 12 on p. 30).

Regarding claims 8-10, 12, 19, and 21, Chen teaches the target enrichment primers are a low concentration of about 0.1 to about 0.5 nM which is only about 1% to 2% for regular exponential PCR) and the target amplification primers which are the

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secondary primers of Chen are at a higher concentration of about 25 to about 50 nM which is non-limiting and thus necessarily is sufficient for exponential amplification (see claim 10 and paragraph 0061). The approximate ranges of Chen thus fall within the claimed ranges as about 0.5 nM which is about 0.0005 μ M is about 0.002 μ M; and about 50 nM is about 0.05 μ M which is about 0.2 μ M.

Regarding claim 14, Chen teaches one target amplification primer at 100 nM and a second reverse primer at the higher concentration of 300 nM (see paragraph 0105) and also teach target amplification primers of SC 4 at 25 nM, SC 5 at 26 nM, and SC 6 at the higher concentration of 50nM (see paragraph 0072) and also being labeled.

Regarding claim 15, Chen teaches at least one of the primers is the SC 4 primer which is detectably labeled with BODIPY Fluorescein and which is used at the higher concentration of 50 nM than the 25 nM concentration of the SC 5 primer (see last sentence of paragraph 0073 and Table 1).

Regarding claims 16 and 18, Chen teaches limited cycles of about 5 to about 10 cycles for target enrichment (see paragraph 0061 and see paragraph 0105 for 10 cycles) and teaches non-limiting PCR for the second amplification and thus necessarily teaches the second amplification can have at least 10 cycles of PCR (see paragraph 0061 and which can be 30 cycles as given in paragraph 0105). It is noted that the second amplification process of Chen is also necessarily selective as the primers used are selective for the target to be amplified.

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Regarding claims 17 and 19, Chen teaches various cycles, times, and temperatures for amplification processes and teaches that these can be varied (see last two sentences of paragraph 0059) and gives examples:

“The thermal cycling conditions were 95°C for 10 min followed by 10 cycles of 95°C for 30 sec, 65°C for 5 sec, ramp at -0.1.degree. C./sec to 55°C, 55°C. for 1.5 min. . . . The secondary reaction used the conditions of 25 cycles of 95°C for 30 sec, 60°C. for 1.5 min with a final extension at 72°C for 10 min.” (see paragraph 0071).

Further regarding claims 17 and 19, Chen teaches as noted above. Chen teaches methods of amplifying nucleic acids with various conditions of cycles, times, and temperatures.

Chen does not specifically teach the exact conditions of instant claim 17 and 19.

It would also have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to use the amplification conditions as used by Chen since these differences in the amplification conditions would not be expected to greatly alter the amount of amplification products generated. Though the effective concentration of a product at any given cycle might be lower, this would be offset by the longer cycle times and or more cycles. “For example, one could use 70°C. as the annealing temperature for the primary reaction and cycle 10 times, then the temperature could be lowered to 50°C for 30 more cycles” (see last sentence of paragraph 0059). This is consistent with the Federal Circuit decision in In re Peterson, 65 USPQ2d 1379, 1382 (Fed. Cir. 2003) “We have also held that a prima facie case of obviousness exists when the claimed range and the prior art range do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties.”

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Thus, an ordinary practitioner would have recognized that the conditions of amplification could be adjusted to maximize the desired results. As noted in *In re Aller*, 105 USPQ 233 at 235,

More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.

Routine optimization is not considered inventive and no evidence has been presented that the selection of amplification conditions was other than routine, that the products resulting from the optimization have any unexpected properties, or that the results should be considered unexpected in any way as compared to the closest prior art. As noted, a skilled artisan would expect the claimed conditions for amplification to have nearly identical results for the amount of amplification products. Thus, an ordinary practitioner would have recognized that the results could be adjusted to maximize the desired results.

Regarding claim 20, Chen teaches the methods that select for SNPs (see paragraph 0079) with a bias towards the first amplification products so that they may be detected (entire publication).

Regarding claim 22, Chen teaches several pairs of primers (entire publication, especially Table 1). The “enhancement primers” of claim 22 are interpreted to be primers used in the method of instant claim 1.

Regarding claim 23, Chen teaches that multiple allele specific primers each paired with a reverse primer which is then multiple pairs of target amplification primers which are used in the methods (see Example 7 especially paragraph 0105).

Regarding claim 27, Chen teaches the design of primers for selecting the agent which is genotype of an allele (entire publication, especially the 2nd sentence of the Abstract).

Regarding claims 28-31, Chen teaches the primer comprise a means of detection of the target sequence which are labels selected from a detectable label selected from the group consisting of fluorescent dyes, antibodies, enzymes, magnetic moieties, electronic markers, mass tags (see claims 1 and 5, paragraphs 0064 to 0067, and paragraph 0075) and FRET labels for direct detection (see paragraph 0066).

Regarding claim 32-34, Chen teaches detection oligonucleotides which are primers incubated with second amplification products to produce and detect a signal of agents which are alleles (see claims 1 and 5 and Abstract) and teaches a unique tag/label for a a given allele (see paragraph 0032). Chen further teaches the primer comprise a means of detection of the target sequence which are labels selected from a detectable label selected from the group consisting of fluorescent dyes, antibodies, enzymes, magnetic moieties, electronic markers, mass tags (see claims 1 and 5, paragraphs 0064 to 0067, and paragraph 0075) and FRET labels for direct detection (see paragraph 0066).

Regarding claims 1-3 and 28, Jeffreys et al. teach methods for multiplex primer-based amplification of a target sequence from a plurality of agents, said target sequence being different for each agent (entire patent, especially claims 1-11), said method comprising:

a. carrying out a first amplification reaction in a two stage amplification (see column 12 lines 1-25) for each target sequence to be amplified using

i) as a template, a nucleic acid from each of said plurality of agents, said nucleic acid containing said target sequence (see Figure 27 and Figures 15A, B, and C);

ii) a first pair of target enrichment primers hybridizing to said nucleic acid and bracketing said target sequence (see Figure 27, Figures 15A, B, and C, step 1 of Example 15 where there are four primers being a first pair and a second pair);

iii) a second pair of target enrichment primers hybridizing to said nucleic acid and bracketing said target sequence (see Figure 27 and Figures 15A, B, and C of Example 15 where there are four primers being a first pair and a second pair), said second pair of target enrichment primers being located proximate to said target sequence and one of the second pair of target enrichment primers comprising at its 5' end a binding tag which is TAG or tail corresponding/complementary to the sequence of one of a pair of target amplification primers the other of the second pair of target enrichment primers comprising at its 5' end a binding tag which is TAG or tail corresponding/complementary to the sequence of the other of said pair of target amplification primers (see Figure 27 and Figures 15A, B, and C and see step 1 of Example 15); and

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- iv) amplification reagents and conditions for said first amplification reaction such that the first amplification reaction generates a plurality of first amplification products which are amplified extension products, wherein at least a portion of the first amplification products contain said target sequence and at least one complement of the binding tag for one of said target enrichment primers thereby forming at least one binding site for at least one of said target amplification primers (see Figure 27 and Figures 15A, B, and C and see step 1 of Example 15); and
- b. carrying out a second amplification reaction in a two stage amplification (see column 12 lines 1-25) for each target sequence to be amplified using
 - i) as a template, said portion of the first amplification products containing said at least one binding site for at least one of said target amplification primers (see Figure 27 and Figures 15A, B, and C and see step 2 of Example 15)
 - ii) at least one of said first pair of target amplification primers which is a tail specific primer binding to its corresponding binding sites on said portion of said first amplification products (see column 12 lines 22-25, Figure 27 and Figures 15A, B, and C and see step 1 of Example 15); and
 - iii) amplification reagents and conditions for said second amplification reaction such that the second amplification reaction generates a plurality of second amplification products containing the target sequence (see column 12 lines 22-25, Figure 27 and Figures 15A, B, and C and see step 1 of Example 15).

It is noted that Jeffreys et al. teach a tail on a primer of the second primer pair but also teach the each primer of the second primer pair can have a tail and where each tail is different by teaching:

“In any relevant preceding aspect of the present invention different type specific primers may comprise different tail sequences to facilitate separation of the amplification products” (see column 7 lines 46-49).

Thus Jeffreys et al. suggest but do not specifically teach that each of the primers of the second primer of the amplification pair has a tail.

That tail primers were well known in the prior art is further evidenced by Erlich et al. but who do not specifically teach the two step amplification methods of claim 1.

Regarding claim 24, Erlich et al. teach detection of the AIDS virus.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the methods of Chen to have at least two primer pairs in the first amplification reaction by as suggested by Jeffreys with a reasonable expectation of success. The motivation to do so is provided by Jeffreys who teach in doing so that: "The invention also provides a novel method for the detection of diagnostic base sequences in one or more nucleic acids contained in a sample" (see last sentence of the Abstract). Thus, the claimed invention as a whole was *prima facie* obvious over the combined teachings of the prior art.

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14. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over either one of (1) Chen '970 or (2) Chen '381, Jeffreys, Erlich et al., and Qiagen as applied to claim 1 above, and further in view of Elnifro et al. (2000).

Chen '970 teaches as note above but does not specifically teach detection of a virus.

Chen '381, Jeffreys, Erlich et al., and Qiagen teach as noted above but Chen '381, Erlich et al. do not specifically teach detection of a virus recited in claim 25.

Regarding claims 24 and 25, Elnifro et al. teach detection of Influenza A and Influenza B viruses by multiplex amplification (entire article, especially Table 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the multiplex methods for detecting nucleic acid sequences of (1) Chen '970 or (2) Chen '381, Jeffreys, Erlich et al., and Qiagen by doing multiplex amplification to detect Influenza A and Influenza B viruses as suggested by Elnifro et al. with a reasonable expectation of success. The motivation to do so is provided by Elnifro et al. who teach: "More recently, it has been demonstrated that multiplex PCR is a useful and rapid diagnostic tool for the management of children with acute respiratory infections (36). This simplified hot start multiplex PCR allows simultaneous screening for nine different infectious agents (enterovirus, influenza viruses A and B, RSV, PIV types 1 and 3, adenovirus, *Mycoplasma pneumoniae*, and *Chlamydia pneumoniae*)" (see 1st sentence of the 2nd paragraph on p. 564). Thus, the claimed invention as a whole was *prima facie* obvious over the combined teachings of the prior art.

15. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen '970 as applied to claims 1, 30, and 32 above, and further in view of Cheung (United States Patent 5,194,300 issued 1993).

Regarding claim 35, Chen teaches various labels for DNA detection but does not specifically teach fluorescent microspheres of claim 35.

Regarding claim 35, Cheung teaches fluorescent microspheres for detection of DNA (see Abstract). Thus it would have been obvious to one of ordinary skill in the art to use fluorescent microspheres for detection of DNA in the detection method of claim 35.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the methods of fluorescent detection of Chen by using fluorescent microspheres as suggested by Cheung with a reasonable expectation of success. The motivation to do so is provided by Cheung who teach: "A single fluorescent microsphere is visible using standard fluorescent microscopy. Therefore the microspheres may be utilized not only to visualize cell surface antigens but also DNA encoding for single genes, by means of a biotinylated DNA probe (see last two sentences of the Abstract). Thus, the claimed invention as a whole was *prima facie* obvious over the combined teachings of the prior art.

16. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over

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Chen '381, Jeffreys, Erlich et al., and Qiagen as applied to claims 1, 30, and 32 above, and further in view of Cheung (United States Patent 5,194,300 issued 1993).

Chen, Jeffreys, Erlich et al., and Qiagen teach as noted above.

Regarding claim 35, Chen teaches various labels for DNA detection but Chen, Jeffreys, Erlich et al., and Qiagen do not specifically teach fluorescent microspheres of claim 35.

Regarding claim 35, Cheung teaches fluorescent microspheres for detection of DNA (see Abstract). Thus it would have been obvious to one of ordinary skill in the art to use fluorescent microspheres for detection of DNA in the detection method of claim 35.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the methods of fluorescent detection of Chen, Jeffreys, and Erlich et al. by using fluorescent microspheres as suggested by Cheung with a reasonable expectation of success. The motivation to do so is provided by Cheung who teach: "A single fluorescent microsphere is visible using standard fluorescent microscopy. Therefore the microspheres may be utilized not only to visualize cell surface antigens but also DNA encoding for single genes, by means of a biotinylated DNA probe (see last two sentences of the Abstract). Thus, the claimed invention as a whole was *prima facie* obvious over the combined teachings of the prior art.

New Rejections Necessitated by Amendment

New Claim Rejections - 35 USC § 103

17. Claims 24, 25, and 89 are rejected under 35 U.S.C. 103(a) as being unpatentable over either one of (1) Chen '970 or (2) Chen '381, Jeffreys, Erlich et al., and Qiagen as applied to claim 1 above, and further in view of Archard et al. (1998) and Shuber (United States Patent 5,882,856 issued 1999).

Chen '970 teaches as note above but does not specifically teach detection of a virus.

Chen '381, Jeffreys, Erlich et al., and Qiagen teach as noted above but Chen '381, Erlich et al. do not specifically teach detection of a virus recited in claim 25.

Regarding claims 24, 25, and 89, Archard et al. teach detection of Coxsackie B enterovirus RNA by nested polymerase chain reaction (entire article, especially the Title). Archard et al. do not specifically teach flap or tailed primers.

Regarding claims 24, 25, and 89, Shuber teach detection of viral DNA (see column 5 line 25) by nested polymerase chain reaction with common tail sequences (entire patent, especially the claims). Shuber does not specifically teach detection of enterovirus.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the methods for detecting nucleic acid sequences with nested primers having tails of (1) Chen '970; (2) Chen '381, Jeffreys, Erlich et al., and Qiagen; or (3) Shuber by applying the methods to nested amplification

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to detect Coxsackie B enterovirus RNA as suggested by Archard et al. with a reasonable expectation of success. The motivation to do so is provided by Archard et al. who teach that use of nest polymerase chain amplification enhanced the sensitivity and specificity of Coxsackie B enterovirus detection (see last paragraph on p. 581 continued to p. 582). As (1) Chen '970; (2) Chen '381, Jeffreys, Erlich et al., and Qiagen; and (3) Shuber teach even further improved sensitivity and specificity with tailed primers, it would have been obvious to one of ordinary skill in the art at the time of the claimed invention to apply the tailed primer methods for detection for Coxsackie B enterovirus to further improve sensitivity and specificity of detection of that enterovirus. Thus, the claimed invention as a whole was *prima facie* obvious over the combined teachings of the prior art.

Conclusion

18. No claim is free of the prior art.

19. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

20. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Staples whose telephone number is (571) 272-9053. The examiner can normally be reached on Monday through Thursday, 9:00 a.m. to 6:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Benzion can be reached on (571) 272-0782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark Staples/

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Primary Examiner, Art Unit 1637

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